

In re: Mis et al.
Serial No.: 09/966,316
Filed: September 27, 2001
Attorney's Docket No. 9180-5
Page 11

REMARKS

Applicants appreciate the thorough examination of the present application as evidenced by the Office Action of July 18, 2003. Applicants further appreciate the indication that claims 6, 7, 8, 18 and 19 would be allowable if rewritten in independent form. In this response, the Applicants have: rewritten Independent Claim 17 to incorporate the recitations of Dependent Claim 18, which has been indicated allowable; canceled Claim 18; and amended Claim 19 to depend from Claim 17. Accordingly, Claim 17 is in a condition that has been indicated allowable, and Dependent Claims 19-28 are patentable at least as per the patentability of Claim 17 from which they depend. In addition, the Applicants have amended Claims 14, 62, 69 to more clearly define the claimed invention; and added new Claims 77-81. The Applicants have not, however, rewritten Claims 6, 7, or 8 in independent form to incorporate the recitations of Claim 1 because the Applicants will show in the following remarks that Independent Claim 1 is patentable. The Applicants will also show that all pending claims are patentable for at least the reasons discussed below. Accordingly, the Applicants respectfully submit that all pending claims are in condition for allowance. A Notice of Allowance is thus respectfully requested in due course.

Consideration of the References Cited in the IDS of June 27, 2003, Is Requested

The Applicants submitted a Supplemental Information Disclosure Statement (IDS) citing 7 references in compliance with 37 C.F.R. Sec. 1.97 on June 27, 2003. Indication of consideration of the 7 references cited in the Supplemental IDS of June 27, 2003, however, has not been received. Copies of the Supplemental IDS (including a Certificate of Mailing dated June 27, 2003), the Post Card Receipt (showing receipt at the U.S. Patent Office on June 30, 2003), and the Form PTO-1449 (citing the 7 references) are attached. Accordingly, the Applicants respectfully request that the Examiner return a copy of the PTO-1449 with indication of

In re: Mis et al.
Serial No.: 09/966,316
Filed: September 27, 2001
Attorney's Docket No. 9180-5
Page 12

consideration of each of the references cited therein. Copies of the 7 cited references will be retransmitted on request.

Claim 1 Is Patentable Over The Cited Art

Independent Claim 1 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over United States Patent No. 6,221,682 to Danziger et al. ("Danziger") in view of United States Patent Application No. 2001/0011764 A1 to Elenius et al. ("Elenius"). The Applicants respectfully submit, however, that the combination of Danziger and Elenius fails to teach or suggest the recitations of Independent Claim 1 for at least the reasons discussed below.

Independent Claim 1, for example, recites:

a method for providing metallurgy structures for input/output pads of an electronic device comprising a substrate including semiconductor portions thereof, and first and second input/output pads on the substrate, the method comprising:

providing first and second metallurgy structures on the respective first and second input/output pads, the first and second metallurgy structures having a shared metallurgy structure adapted to receive solder and wire bonds. (Underline added.)

The Applicants respectfully submit that the combination of Danziger and Elenius fails to teach or suggest a shared metallurgy structure adapted to receive solder and wire bonds. In particular, the Office Action concedes that:

Danziger et al. does not teach a shared metallurgy structure on the bond pads to bond solder bumps, wire or additional substrates....

Office Action, page 2. Each of Figures 1B, 2, and 3 of Danziger show wire connections (26) connected to pad (12) on die (14), and solder ball (10) on die (14). Accordingly, a structure between wire connections (26) and die (14) is different than a structure between solder ball (10) and die (14) because the pad (12) is provided between wire connection (26) and the die (14) but not between the solder ball (10) and the die (14). Accordingly, Danziger teaches away from a shared metallurgy structure adapted to receive solder and wire bonds.

In re: Mis et al.
Serial No.: 09/966,316
Filed: September 27, 2001
Attorney's Docket No. 9180-5
Page 13

Moreover, it would not be obvious to selectively combine aspects of Elenius and Danziger to somehow teach or suggest the recitations of Claim 1. Elenius discusses a redistribution trace 30 and solder bump pad 26 that are provided as a patterned metal layer. In addition, a second passivation layer 32 is applied over such patterned metal layer, and conventional photolithography techniques are used to form a patterned opening within second passivation layer 32 at the site of the solder bump pad 26. (See, Elenius, paragraph 34.) Once the second passivation layer is patterned, a ductile solder ball, like solder ball 28, is formed upon the exposed solder pad. (See, Elenius, paragraphs 36-37.) More particularly:

This patterned metal layer is preferably formed by first blanketing the front surface of semiconductor wafer 14 with a so-called Under Bump Metallurgy (or UBM) Layer. Preferably, this UBM layer is a triple-metal stack structure of Aluminum (Al), Nickel Vanadium (NiV), and Copper (Cu); alternatively, the UBM layer could be a triple-metal stack structure of Titanium (Ti), Nickel Vanadium (NiV), and Copper (Cu) or other suitable metal structure.

Elenius, paragraph 34.

As set forth in Section 2143 of the Manual For Patent Examining Procedure, three basic criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. In addition, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

It would not be obvious to substitute the solder bump pad 26 of Elenius for the pad 12 (used for wire connection 26) of Danziger, because the pad 12 of Danziger is on the die 14, while the solder bump pad 26 of Elenius is exposed through an opening within second passivation layer 32. Moreover, Danziger teaches

away from a shared metallurgy structure adapted to receive solder and wire bonds because Danziger clearly shows different structures used for wire and solder bonds.

Accordingly, the Applicants respectfully submit that Claim 1 is patentable over the combination of Danziger and Elenius. The Applicants further submit that Claims 80 and 81 are patentable for reasons discussed above with regard to Claim 1. In addition, Dependent Claims 2-16 are patentable at least as per the patentability of Claim 1 from which they depend. In the event that any rejections should be maintained based on the combination of Danziger and Elenius, the Applicants respectfully request that the Examiner identify particular motivation for the combination in the references.

Claim 62 Is Independently Patentable Over the Cited Art

Independent Claim 62 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over United States Patent No. 6,221,682 to Danziger et al. ("Danziger") in view of United States Patent Application No. 2001/0011764 A1 to Elenius et al. ("Elenius"). Claim 62, however, is patentable over the combination of Danziger and Elenius.

Claim 62 recites a method for providing bonding structures for input/output pads of an electronic device including a substrate and first and second input/output pads on the substrate. The method includes:

providing first and second barrier layers on the respective first and second input/output pads wherein the first and second barrier layers each comprise nickel wherein the first and second barrier layers have a same thickness;

providing first and second passivation layers on the respective first and second barrier layers wherein the first and second passivation layers comprise a same material other than nickel and have a same thickness; and

providing a solder structure on the first passivation layer while maintaining the second passivation layer free of solder.

As discussed above, the combination of Danziger and Elenius fails to teach or suggest a shared metallurgy structure adapted to receive solder and wire bonds. This combination also fails to teach or suggest structures including barrier and

In re: Mis et al.
Serial No.: 09/966,316
Filed: September 27, 2001
Attorney's Docket No. 9180-5
Page 15

passivation layers of same materials and thicknesses where a solder structure is provided on one of the structures and another of the structures is maintained free of solder. In particular, Danziger discusses wire connections 26 to die 14 using pads 12, and solder balls 10 on die 14 without pads 12. Accordingly, Danziger fails to teach or suggest a first structure provided with solder and a second structure maintained free of solder wherein the first and second structures comprise layers of same materials and same thicknesses.

Elenius fails to provide the missing teachings. In particular, Elenius states that: "Ductile solder balls, ... are formed on each such solder pad for allowing the resulting structure to be directly surface mounted to a circuit board or other substrate." (Elenius, paragraph 0019). Elenius thus also fails to teach or suggest that a first structure is provided with solder and a second structure is maintained free of solder.

Accordingly, the Applicants respectfully submit that Claim 62 is patentable over the cited art. The Applicants further submit that Claim 13 is independently patentable for reasons similar to those discussed above with regard to Claim 62. In addition, Dependent Claims 14-15 and 63-68 are patentable at least as per the patentability of Claim 62 from which they depend.

Claim 14 Is Independently Patentable Over the Cited Art

Dependent Claim 14 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over United States Patent No. 6,221,682 to Danziger et al. ("Danziger") in view of United States Patent Application No. 2001/0011764 A1 to Elenius et al. ("Elenius"). Claim 14 is patentable for at least the reasons discussed above with regard to Claim 1. Claim 14 is also patentable for at least the additional reasons discussed below.

In addition to the recitations of Claim 1 discussed above, Claim 14 further recites:

providing a solder structure on the first metallurgy structure opposite the substrate;

maintaining the second metallurgy structure free of solder; bonding a wire to the second metallurgy structure; and bonding a second substrate to the first substrate via the solder structure, wherein the wire is bonded to the second metallurgy structure and the second substrate is bonded to the first substrate at a same time.

Danziger fails to teach or suggest a wire and a second substrate bonded to a first substrate at a same time. As discussed in Danziger:

In the embodiment where device (22) is the end use device, the die will be first be KGD tested after forming metallurgical contacts between the stress tolerant solder ball array or flip-chip C4 array balls as illustrated in FIG. 2. After KGD testing, the die (14) is removed from the test device (20) by melting the solder balls and separating the KGD from the device (20). Then, the die is installed in an end use device, as shown in FIG. 3 by completion of a wire connections (26) between die (14) and end use device (22). ...

In another embodiment, when it is desired to use solder ball array or flip-chip C4 array connections as the final contact to an end use device (20), as shown in FIG. 2, then the die (14) is KGD tested on a test device (22), as shown in FIG. 3. Here, wire connections (26) connect pads (12) to pads (28) on the test device (22) and KGD testing is carried out. Next the die (14) is removed from the test device (22) and installed on an end use device (20) as illustrated in FIG. 2. (Underline added.)

Danziger, col. 8, lines 5-25. Danziger thus discusses solder connections and wire connections that are provided at different times. Danziger, thus teaches away from a wire and a second substrate bonded to a first substrate at a same time. Neither Elenius or U.S. Patent No. 5,234,149 to Katz et al. discuss wired connections.

Accordingly, the Applicants respectfully submit that Claim 14 is independently patentable over the cited art. The Applicants further submit that claims 69 and 78-79 are patentable for reasons similar to those discussed above with regard to Claim 14. In addition, Dependent Claims 70-73 and 76 are patentable at least as per the patentability of Claim 69 from which they depend.

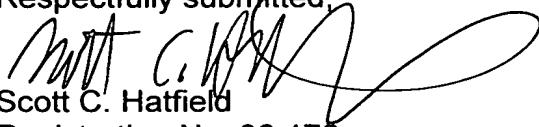
CONCLUSION

Accordingly, the Applicants submit that all pending claims in the present application are in condition for allowance, and a Notice of Allowance is respectfully

In re: Mis et al.
Serial No.: 09/966,316
Filed: September 27, 2001
Attorney's Docket No. 9180-5
Page 17

requested in due course. The Examiner is encouraged to contact the undersigned attorney by telephone should any additional issues need to be addressed.

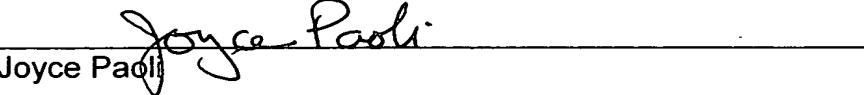
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